

ABSTRACT OF THE DISCLOSURE

An optical filter using alternating layers of materials with “low” and “high” indices of refraction and deposited with atomic layer control has been developed. The multilayered thin film filter uses, but is not limited to, alternating layers of single crystal, polycrystalline or amorphous materials grown with self-limiting epitaxial deposition processes well known to the semiconductor industry. The deposition process, such as atomic layer epitaxy (ALE), pulsed chemical beam epitaxy (PCBE), molecular layer epitaxy (MLE) or laser molecular beam epitaxy (laser MBE) can result in epitaxial layer by layer growth and thickness control to within one atomic layer. The alternating layers are made atomically smooth using the patent pending Chemical Reactive-Ion Surface Planarization (CRISP) process. Intrinsic stress is monitored using an in-situ cantilever-based intrinsic stress optical monitor and adjusted during filter fabrication by deposition parameter modification. The resulting filter has sufficient individual layer thickness control and surface roughness to enable ~ 12.5 GHz filters for next generation multiplexers and demultiplexers with more than 1000 channels in the wavelength range 1.31 - 1.62 μm .

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